NLGI Spokesman

Journal of National Lubricating Grease Institute

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President's page

by W. Wayne Albright, President, N L G I

LUBRICATING GREASES IN RETROSPECT

We need to stop and look back occasionally at past accomplishments; to reassess our progress in terms of what has gone before. In this spirit it might be well to point out a few highlights in the history of lubricating greases. We might even make a prediction or two about future developments, having observed past and present trends.

THE BEGINNINGS

The use of grease-like substances for lubricating bearings may date back as far as the 14th Century B.C. when the Egyptians were believed to have used fat and lime (lime soap) to grease the axles of their chariots. The word "grease" itself was derived from a Latin word meaning fat.

True greases, mixtures of various soaps and lubricating oils, appeared around the middle of the last century. Petroleum oils were used to make lubricating greases as early as 1850. These first greases were usually mixtures of crude oil, rosin and lime prepared in an open kettle heated over a coal fire. They were used principally to grease wagon axles and other crude, loose-fitting bearings.

The machinery developments associated with the industrial revolution soon exerted their influence on lubricating greases. Better products were needed to keep shafts moving. Manufacture of lubricating greases became an established business and each greasemaker tried to outdo his competitors in producing new and better lubricating greases.

THE ART OF GREASE MAKING

During this early period, manufacture of lubricating greases was considered an art, details of which were jealously guarded. The handicraft of grease making was often passed from father to son. Ten to fifteen years of training were necessary to qualify a grease maker. Grease formulas and the mixing of the ingredients were controlled by individual judgment; trial and error methods.

But the demand for more and better lubricating greases, growing with the development of machinery that ran at ever higher speeds and introduced the lubrication problems of precision-fitted bearings, outgrew these archaic manufacturing methods. Here we see a basic developmental trend that is present today and will continue in the future to influence lubricating grease production. New and better machines require new and better lubricating greases produced by new and better manufacturing methods.

RESEARCH AND LUBRICATING GREASES

Hand in hand with improvements in manufacturing techniques came improved products due to research in lubricating greases. Investigations were conducted on the nature of greases and on the components used in making greases. Grease testing machines were devised. Devices for applying lubricating greases to bearings were improved. Grease making became more and more of a science. Today we have many lubricating greases, both petroleum and nonpetroleum, designed to handle specific lubrication requirements.

NLGI AND LUBRICATING GREASES

Along with the development of grease making as a science instead of an art, manufacturers and others interested in lubricating greases began to share their knowledge. It is in this cooperative endeavor that the NLGI realizes one of its most important roles: collection and dissemination of technical information.

LOOKING INTO THE CRYSTAL BALL

Looking into the future we can appreciate that as lubrication requirements change, the lubricating grease industry will meet the challenge by developing suitable lubricating greases. Continuing research on improved products, manufacturing techniques and devices for applying greases will assure adequate lubrication of the machines of the future.

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IN THIS ISSUE

ABOUT THE COVER

THIS MONTH OUR ARTIST, Ronald Jones, went way back to the turn of the century when automobile lubrication was strictly a home made job. We don't rightly know if it was performed under "a spreading chestnut tree" or the protective comfort of the old stable recently turned into a garage. We do think he caught the cool comfort of an earlier era when the motorist didn't know he had to "lubricate for safety every 1,000 miles;" but did know he had to do it himself. Maybe the era wasn't so comfortable after all, considering that our pioneer motorist doubling as service station man, probably smeared more grease on himself and the bench than went into the cups. Remember them, somehow they always seemed to gather grit you could hear grinding into the threads as you twisted them back on again.

IMPROVED METHODS

Grease Analysis

SUMMARY

Considerable difficulty has been encountered in applying ASTM D128-47 Method I to the analysis of greases containing synthetic oils, silica gels, hydroxyacid soaps and miscellaneous organic materials. This ASTM method involves decomposition of the grease by digestion with mineral acid, followed by solvent partition of the various components. Such drastic treatment frequently results in partial decomposition of some of the fatty acids and oil-base constituents. In some cases, incomplete hydrolysis of soaps or formation of gelatinous mixtures has resulted in complete failure of this method or in poor reproducibility.

This article describes the development of simple procedures for isolating the principal constituents of greases. These techniques are applicable to greases formulated from materials interfering with application of standard methods of grease analysis, as well as to greases amenable to accepted procedures.

Two procedures have been developed for the initial breakdown of greases. Both of these techniques are rapid, and mild enough to avoid decomposition of oil-base components. One technique, applicable to alkali soap greases, employs a solvent extraction step which takes advantage of the solubility of the soaps in a water-alcohol mixture at temperatures of 140-160°F. The other method, for use with alkaline earth and aluminum soap greases, utilizes an excess of cold formic or acetic acid to effect breakdown of the grease.

No general elapsed-time comparisons can be made between the improved procedures and current standard methods, due to inadequacy of the latter in analyzing certain types of greases. However, their use for analysis of greases amenable to analysis by standard methods, results in savings in time in the order of 25 to 50 per cent. The accuracy and precision of these methods are adequate or better for control work and for analysis of most samples of interest to research groups.

INTRODUCTION

Advances in grease research and technology have led to products containing such diverse materials as silica gels, bentonite clays, silicones, polyalkylene glycols, aliphatic diesters, hydroxyacid soaps, fatty acid soaps and lubricating oils. Minor amounts of anti-oxidants, metal deactivators, rust-preventive agents, etc., are also incorporated in some greases to confer special properties. As a consequence, many of these lubricants are not amenable to analysis by ASTM procedure D-128-47 Method I which involves digestion with mineral acid, followed by solvent partition of the various components. If silicones or clays are present, highly gelatinous mixtures frequently form in the hot-acid digestion step. These are almost impossible to separate using techniques described by this standard method. Secondly, ester-type synthetic oils (constituents of some greases) hydrolyze during hot acid digestion. A third complication arises when hydroxyacid soaps are present. To effect quantitative hydrolysis of these, digestion for several hours with hot, relatively concentrated acid is required. In the process some of the oil-base components are decomposed and identification and quantitative determination is made difficult. Finally, aliphatic hydroxyacids tend to be rejected to the oil-hexane phase in a solid form because of their slight solubility in both water and aliphatic solvent. In this condition they are difficult to saponify. The polar and nonpolar solvents employed in D-128-47 were selected when greases were mainly of the mineral oil-soap variety and, therefore, are not particularly suitable for use with some current products.

In recognition of the foregoing and related problems

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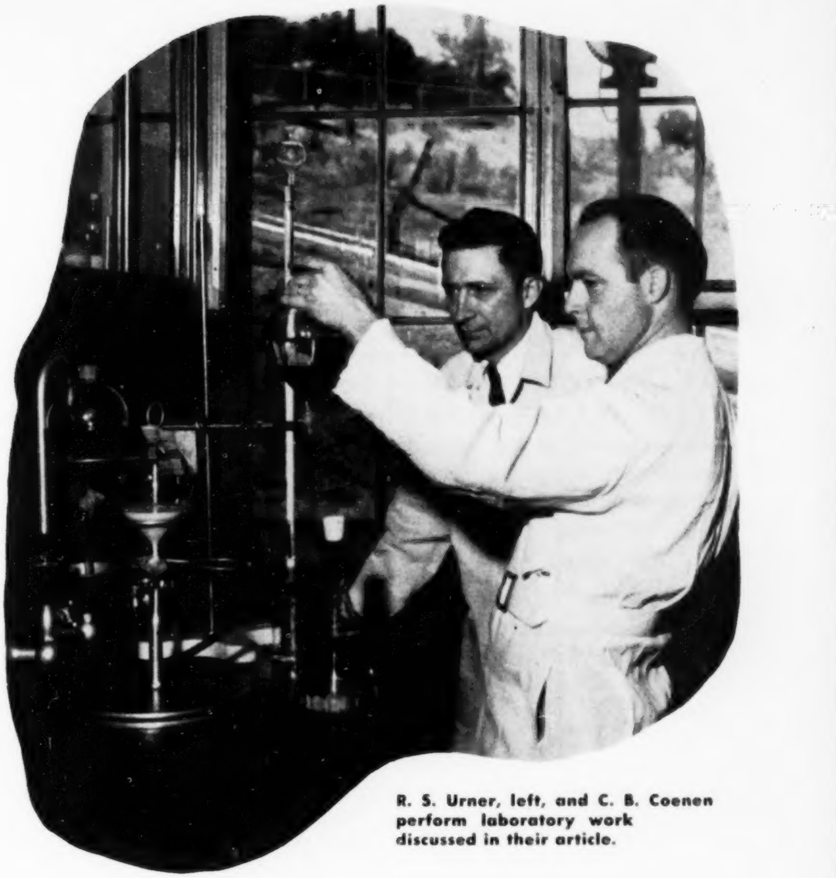


R. S. Urner, left, and C. B. Coenen perform laboratory work discussed in their article.

an investigation of separation procedures was initiated with the purpose of improving the standard method and reducing the time required per analysis. The results of this study are discussed in the sections which follow.

OUTLINE OF PROCEDURES

It was postulated that the deoiling technique used in the analysis of petroleum sulfonates (ASTM D-855-46T) might be equally applicable to the deoiling of aliphatic soaps. This was found to be true for soaps whose metallic constituent belongs to the alkali metal group, such as sodium and lithium. In addition the postulation was found to hold for soaps of the hydroxy type, provided the temperature at which the partitioning step is carried out is held above 140°F.

In the case of soaps whose metallic constituent is one of the alkaline earth metals or aluminum, the metathetical conversion with alkali metal carbonates to give an alkali metal soap is less successful in grease analysis than in a parallel sulfonate analysis. Quantitative separations are not obtained, possibly because of an unfavorable equilibrium. It was found, however, that if a grease containing an alkaline earth or aluminum soap is finely dispersed in an aliphatic hydrocarbon solvent the metathesis can be accomplished with cold acetic, formic or hydrochloric acid solutions. Thus, the necessary hydrolysis can be accomplished without the hot acid digestion called for by the standard procedure and, oxidation and partial decomposition of oil-base constituents is avoided.

Alkali Soap Greases

Greases containing an alkali soap are completely dispersed in hexane. Solution and partitioning of the soap and oil constituents is accomplished by adding a hot 50-50 mixture of water and isopropyl alcohol (IPA), agitating and settling, using a hot water bath if necessary to keep the soaps in solution. Fillers and inorganic gelling agents are collected on an asbestos filter mat, washed with hexane and a hot 50-50 water-IPA mixture, and determined directly. The phases containing the partitioned soaps and oil are separated. Each is freed from entrained material by repeated extractions with hexane or 50-50 water-IPA. The constituents of the separated phases are then determined directly as soap and oil by evaporation of solvents (see Appendix A for details of procedure).

Alkaline Earth and Aluminum Soap Greases

Greases containing soaps of alkaline earths and aluminum are completely dispersed in hexane. The soaps are then hydrolyzed and separated by treating with cold 50% acetic acid solution, agitating vigorously and allowing to settle. Several such additions of acid usually

are required. The metallic portion of the soap is separated as a soluble salt after repeated extractions with hexane to remove traces of oil and fatty acids. The salt-acid solution is evaporated to dryness and ashed with sulfuric and nitric acids in platinumware, to determine the metallic portion of the soap. The organic phase is then analyzed by ASTM D-128-47 Method I to determine the fatty acids and oil (see Appendix B for details of procedure). From these determinations, the original soap and oil contents may be calculated. Fillers and inorganic gelling agents in alkaline earth soap grease are best determined on a separate sample by the usual procedure, ASTM D-128-47.

DISCUSSION OF PROCEDURES AND EXPERIMENTAL RESULTS

Several greases of known composition were analyzed to establish the utility and accuracy of the proposed new procedures. The greases, used as examples, contained the substances listed in Table I.

Soaps and Fatty Acids

Alkali Soaps

The soaps of alkali metals are moderately soluble in hot solutions of IPA and water. Accordingly, an extraction and partitioning technique can be employed for separating them from greases containing this type of gelling agent. The procedure works equally well for the alkali soaps of aliphatic-hydroxy acids, but complete separation of the soaps is possible only if a temperature of 140° F. or above is maintained during the extraction step.

Alkaline Earth and Aluminum Soaps

The soaps of the alkaline earth metals and aluminum are, to some degree, metathesized to the alkali metal soaps by treatment with alkali carbonates, but not completely enough to provide a quantitative separation from other grease constituents. In addition these soaps are only slightly soluble in alcohol-water mixtures and have high affinities for hydrocarbons. Accordingly, application of this simple extraction system to their separation is impractical. Other possibilities which have been considered, but not thoroughly investigated because of various difficulties, are metathesis using a mixture of alkali carbonate and sulfate, and the complexing of di- and trivalent metals with Versene, sodium (ethylenedinitrilo) tetraacetate.

Cold acid hydrolysis of metal soaps was found to take place rapidly if the greases were well dispersed in hexane solvent. Hydrolysis proceeds in acetic, formic and hydrochloric acid solutions and the rate is substantially proportional to the acid strength. Acetic acid has been selected for the present purpose, however, because less discoloration and decomposition are associated with its use than is the case with solutions of the stronger acids. In addition, acetates of the alkaline earth metals are sufficiently soluble in acetic acid to make removal of the metallic constituents of their soaps convenient and rapid.

TABLE I

Greases Employed in Development of Analytical Methods

Grease	*Major Constituents*
A	Lithium hydroxystearate, mineral oil
B	Lithium stearate, mineral oil, aliphatic diester
C	Sodium soaps of animal fatty acids, mineral oil
D	Calcium stearate, mineral oil
E	Aluminum stearate, mineral oil

TABLE II

Accuracy of Proposed New Methods for Determining the Soap Content of Greases

	Soap Content, %w		
*Sample**	*Known*	*Found*	*For Method Used See*
A	6.45	6.45	Appendix A
B	15.7	15.8	Appendix A
C	15.9	14.5	ASTM D-128-47
C	15.9	15.7	Appendix A
D	12.0	11.8	Appendix B
E	5.5	5.7	Appendix B

*See Table I for description of these lubricants.

Table II shows a comparison of the percentage of soap found with the percentage of soap known to be present in several representative greases analyzed by the methods discussed on the preceding page.

Sample C was analyzed by both ASTM D-128-47 Method I and the procedure set forth in Appendix A. It will be noted that the new method gave a value closer to the one anticipated than did ASTM D-128-47 Method I.

Table III gives a comparison of pertinent properties of fatty acids sprung from several soaps which had not been incorporated in greases, with acids sprung from soaps extracted by the newly developed technique.

These data show only a fraction of the variations between known and found values that are commonly observed when the constituents of greases are separated by rigorous standard methods. This is because the organic portions of the soaps have not been partially decomposed, as they are when a hot acid digestion step is employed.

Fillers

Fillers in greases containing alkaline earth or aluminum soaps are best determined by the standard ASTM procedures.

Fillers in greases containing alkali soaps are conveniently determined by the procedure outlined in Appendix A. This method is especially applicable when fillers such as powdered lead, graphite, carbon black, asbestos, etc., are present. By suitable filtration these materials may be separated and determined without impairing the sample so far as subsequent soap and oil determinations are concerned. Such a procedure is convenient when the amount of sample available for analysis is limited. However, this type of filler usually represents only a very small proportion of a grease, and if the amount of sample permits, it is frequently desirable to determine such fillers on a separate portion.

Inorganic Gelling Agents

As mentioned above, application of standard methods requiring acid digestion leads to gel formation and attendant separation problems when certain types of inorganic gelling agents are present.

Silica gel, magnesium carbonate, bentonite clays and similar inorganic gelling agents are determined by the procedure outlined in Appendix A.

If fillers as well as inorganic gelling agents are present the two are separated together from the soap and oil phases. Thereafter, wet chemistry procedures, flame photometry, emission spectroscopy or a combination of these tools are employed to determine the percentage of each constituent.

Oils

Petroleum base-oils in greases are relatively easy to separate and determine by the procedures outlined in Appendices A and B, as well as by standard procedures. The accuracy in such determinations suffers, however, for several reasons: (1) the composition of both oil and soap sometimes changes in the grease making process; (2) the length of time and the amount of heating re-

TABLE III

Properties of Organic Acids Sprung From Unused Soaps and Soaps Separated From Greases

Source of Acid	*Color*	*Melting Point °F, uncorrected*	*Acid Number mg KOH/g*	*Iodine Number $gI_2/100g$*
A. From hydrogenated castor oil soap	yellow-white	161.5	184.8	1.21
A. From grease—Run 1	tan-white	160.7	190.7	0.89
Run 2	tan-white	161.0	188.0	1.12
B. From fatty acid soap	white	133	216	0.15
B. From grease	tan-white	131	209	0.25

TABLE IV

Oil Content of Representative Greases

Grease *	Oil Content, %w Known	Found	For Method Used See
A	93.5	93.4	Appendix A
B	84.1	82.4†	Appendix A
C	84.1	87.0	ASTM D 128-47
C	84.1	85.4	Appendix A
D	88.0	87.9	Appendix B
E	94.5	94.4	Appendix B

* See Table I for general composition.

† A certain amount of light oil was present and some of this was lost during removal of solvents.

quired to remove moisture and solvent from the separated oil components varies with the type of oil used in the grease; etc. Therefore, estimation of physical properties of the oils used in preparing a grease, from an examination of recovered constituents, is difficult. However, the extraction technique described in Appendix A and the cold acid hydrolysis of Appendix B help considerably in avoiding further decomposition or change in the oils during separation and analysis.

In Table IV a comparison of the percentage of oil found with the percentage known to be present in several greases is presented.

Here, as in Table II, the results by the methods described in Appendix A are more nearly in agreement with those anticipated than are values obtained by ASTM D-128-47 Method I. In general the accuracy of oil determination is shown to be very satisfactory.

In Table V pertinent physical properties of oils used in, and oils recovered from the previously described greases are compared.

On examination of the data in Table V it will be noted that there is good agreement between the properties of the original and those of the recovered oils. The effect of heating at atmospheric pressure and under vacuum, in simulation of solvent removal, is shown to be noticeable with respect to color in several cases. Accordingly, it appears desirable to limit temperature and time when removing solvent and moisture from extracted oil components.

Mixed Petroleum Base-Oils and Aliphatic Diesters

Both aliphatic diesters (indicated by high viscosity indices and high saponification numbers on recovered oils) and mineral oils are present in some of the newer greases and separation of these components is frequently desired. Such a separation can often be made by partitioning the components on silica gel. In a typical case 4.425g of oil separated from Grease B was diluted with 12 ml of isopentane (iC_5) to facilitate transfer and charged to a 1 inch x 60 inch silica gel column (40:1/gel:

TABLE V

Properties of Oils Employed in the Manufacture of Several Greases

Oil *	NPA Color	Viscosity at 100°F. SSU	Viscosity at 210°F. SSU	Viscosity Index	Saponification No. mg KOH/g
A_1	5–	723	61.9	33	—
A_2	5–½	709	61.6	34	—
A_3 Run 1	6_+	655	60.2	38	—
2	6–½	685	60.9	36	—
3	6_+	707	60.9	30	—
4	7	688	60.7	33	—
5	7	693	60.9	33	—
6	7	696	60.8	31	—
B_1	1–½–	73.4	37.3	140	192
B_2	1–½–	73.8	37.7	140	194
B_3	4–	74.5	38.0	151	205
C†	6–	1500	85.0	33	—
C (by standard method)	Black	860	68.8	49	—
C (by improved method)	8_+	1031	73.0	43	—
D_1	2–½	311	48.4	40	—
D_2	3	308	48.3	41	—
D_3	4	301	48.2	43	—
E_1	3_+	749	62.7	33	—
E_2	4	742	62.2	31	—
E_3	6	661	60.1	34	—

* Sub-number 1 refers to unused base-oil.

Sub-number 2 refers to unused base-oil which had been heated to 250°F. and then held at 175°F. under 29-30 in. Hg vacuum for 2-3 hr.

Sub-number 3 refers to base-oil recovered from grease under the conditions described by sub-number 2.

† Average properties of oil used in this application.

oil ratio), prewet with a minimum quantity of iC_5. The saturate component of the mineral oil was then eluted with 500 ml of iC_5 and the aromatic fraction with 300 ml of benzene; these were combined to determine the mineral oil content. The diester component was eluted with 500 ml of 95% ethanol followed by 300 ml of water. The latter displaced a small amount of acidic material which was probably present as an impurity in the diester. The reliability of this procedure is indicated by the data given in Table VI for Grease B, whose composition was known.

TABLE VI

Chromatographic Separation of a Mineral Oil and an Aliphatic Diester

	%w Present Known	Found	Refractive Index, n_D^{20} Known	Found
Mineral oil	19.6	19.6	1.47913	1.47643
Aliphatic diester	80.4	80.3	1.45073	1.45100

Other Synthetic Oils

In the course of this investigation several greases were analyzed which contained polyalkylene glycols or polyalkylene glycol derivatives. These synthetic lubricants may be of either the water soluble or the hydrocarbon soluble type. Both types are characterized by high viscosity indices.

Water soluble polyalkylene glycols associated with mineral oils in a grease can be separated without difficulty by the procedure described in Appendix A. The petroleum oil is retained by the hexane phase while the water soluble polyalkylene glycol fluid enters the IPA-water phase. The latter may then be isolated by salting-out with ammonium carbonate in a hot (140-150°F.) water bath, since the solubility of glycols of this type varies inversely with temperature. The water-salt phase is discarded and the polyalkylene glycol recovered by evaporation of the IPA.

Greases containing hydrocarbon-soluble glycols, as the base components, were analyzed in this program but none containing both mineral oil and oil-soluble glycol was examined. It is believed, however, that they could be separated by silica gel chromatography in much the same manner as mineral oil-aliphatic diester mixtures. One possible difficulty rests in the size of polyalkylene glycol molecules. These might not be adsorbed readily by the small pores of silica gel. If not it might be necessary to employ an adsorbent with a larger pore size, such as alumina.

TABLE VII

Repeatability of the Improved Procedure for Alkali Soap Greases

	Soap, %w		*Oil, %w*	
Grease	*Known*	*Found*	*Known*	*Found*
A-Run 1	6.45	6.45	93.5	93.4
Run 2		6.49		93.5
Run 3		6.50		93.2
Run 4		6.39		93.3
Run 5		6.41		93.3
Run 6		6.39		93.6
Average		6.44±0.065		93.4±0.16

A cursory examination suggests that silicone oils of the type used in greases can be separated in the same way that mineral oils are recovered.

Accuracy and Precision

As an example of the accuracy and precision possible with the methods discussed in this article and in particular with the procedure described in Appendix A, data obtained in six analyses of Grease A are presented in Table VII.

It will be observed that these results are considerably better than those usually obtained by the now standard methods.

APPLICATIONS

In addition to the greases described in the preceding sections numerous other lubricants have been analyzed by these procedures. In Table VIII the variety of components dealt with is indicated.

TABLE VIII

Miscellaneous Greases Analyzed by These Improved Methods

Grease	*Oil*	*Soap*	*Inorganic Gelling Agent or Filler*
F	Petroleum oil-polyalkylene glycol derivative		SiO_2-$MgCO_3$
G	Polyalkylene glycol derivative	Lithium beeswax	None
H	Petroleum oil	Lithium animal fat soaps	None
I	Petroleum oil	Barium animal fat soaps	SiO_2
J	Petroleum oil	Calcium and lithium animal fat soaps and stearates	None
K	Aliphatic diester	Lithium stearates	None
L	Petroleum oil	Lithium and calcium stearates	Graphite

Several of the greases described above were found to be difficult or impossible to analyze by standard methods. By applying the improved procedures discussed in this paper time was saved and accuracy improved.

These procedures are also applicable to:

1. the isolation of metallic and brasive particles in used soaps and greases,

2. greases containing both alkali metal and alkaline earth soaps, and

3. samples smaller than those which can be handled conveniently by standard methods and in some cases to quantities of micro-proportions.

The analysis of grease containing unusual components as well as conventional ingredients can be greatly facilitated by application of flame photometric and emission spectroscopic procedures to gain qualitative information regarding the type of constituents present, before proceeding by any of the methods discussed.

APPENDIX A

Procedure for Alkali Soap Greases*

The sample (35-45 g) is dispersed in 200 ml of hexane in a 1000 ml separatory funnel by vigorous agitation. Soaps are dissolved by adding approximately 150 ml of hot IPA and water (1:1) and agitating the mixture. When the phases are allowed to separate, any fillers present normally form a cuff at the interface between the two phases.

Fillers and/or Inorganic Gelling Agents

Fillers and inorganic gelling agents are determined by filtering with suction through a previously dried filter. A gooch crucible with an asbestos mat is convenient. The materials collected on the filter are washed with hexane and a hot water/IPA mixture, dried in a vacuum oven, cooled and weighed. The filtrate from this step is quantitatively retained in a suction flask. If both fillers and inorganic gelling agents are present they must be resolved by wet chemistry procedures, flame photometry, emission spectroscopy or a combination of these methods.

Soaps

The filtrate is transferred to a separatory funnel and is kept warm in a hot-water bath until phase separation is complete. A temperature of 140-150°F. encourages clear and sharp separation, especially when hydroxyacid soaps are present. If the mixture emulsifies, small additions of IPA are made to bring about the desired phase separation. The phases are then removed and each in turn is subjected to further extraction with hexane or a water/IPA mixture to complete the separations. Normally three such extractions are sufficient. The water/IPA phase, containing the soaps, is either (a) evaporated to dryness in bulk, dried in a vacuum oven for one hour and weighed or (b) diluted to a known volume and an aliquot evaporated to dryness, dried in a vacuum oven for one hour and weighed. The latter step, being much shorter, is suitable for control work and other operations where speed is essential.

Oil

The hexane phase, containing the oil constituent, is filtered through a cotton or glass wool plug, evaporated to remove solvents, dried in a vacuum oven for two hours, cooled and weighed. Two hours is an average time for approaching a constant weight; different oil constituents require different times for removal of traces of solvent and moisture.

APPENDIX B

Procedure for Alkaline Earth and Aluminum Soap Greases *†‡

The sample, after dispersion in hexane (see Appendix A), is treated with 50 ml of cold 50% acetic acid (cold 25% hydrochloric or 50% formic acid may also be used) and agitated to hydrolyze the soaps present. About 50 ml of water is then added, the mixture agitated, and finally allowed to settle. The water-acid phase containing the metallic constituents is drawn off and collected in a second separatory funnel. Several acid and water washes may be required to remove all metallic constituents. The combined water-acid extracts are washed with hexane to remove petroleum oils, and the hexane extracts combined.

The water-acid extract is evaporated to dryness in a platinum dish and ashed with sulfuric and nitric acids, to determine the metallic portion of the soap.

* Free alkalinity, free acidity, unsaponifiable oils, etc., are determined in the same manner as in standard procedures and corrections applied where necessary.

*†‡ *See page 17.*

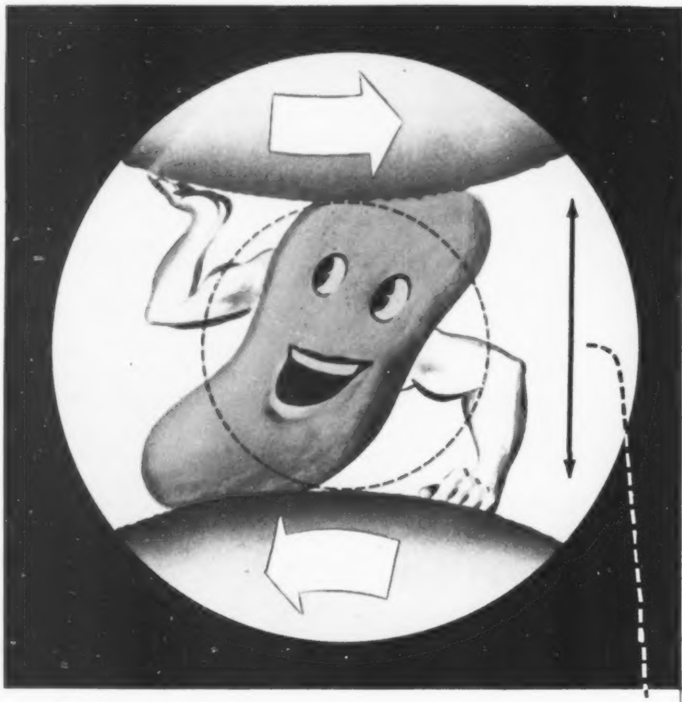
The hexane phase, containing mineral oils and fatty acids, is analyzed by ASTM D-128-47 Method I to determine these constituents. The soap content is then calculated from the fatty acids and the metal content of the ash.

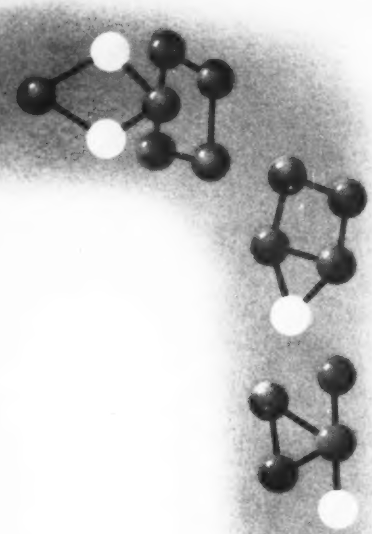
Fillers in greases of these types are best determined on a separate sample by the standard ASTM procedure.

* Free alkalinity, free acidity, unsaponifiable oils, etc., are determined in the same manner as in standard procedures and corrections applied where necessary.

† When hydroxyacid soaps are present, such as calcium hydroxystearate, the acid hydrolysis rejects the hydroxystearic acid to the hexane phase. Because of its low solubility in aliphatic solvents, most of the hydroxyacid exists in the hexane phase as a floc. Traces of hydroxystearic acid entrained in the acid-water phase can be isolated by an ether extraction. After evaporation of the ether, this fraction is dissolved in hot hexane and added to the hexane phase. The hexane phase is then analyzed by ASTM D-128-47 Method I for hydroxystearic acid.

‡ Greases which contain dopes, such as lead naphthenate, can be resolved in a manner similar to those containing calcium hydroxystearate. However, after conversion of the naphthenic acids to the sodium soaps some difficulty is encountered in completely extracting the soaps from the oil phase. Experience has shown that a 50-50 mixture of water and tertiary butyl alcohol is a better extractant for sodium naphthenates than a similar mixture of isopropyl alcohol and water. Complete removal of the soap may not be achieved, however, and it is often necessary to calculate the amount of soap entrained in the oil from a sulfated ash determination on the oil and the equivalent weight of the naphthenic acids subsequently extracted. No difficulty has been encountered in ashing lead containing extracts in platinumware. Incineration is performed at a low temperature, and sulfation of the ash is repeated several times before muffling at 550°C. to constant weight.





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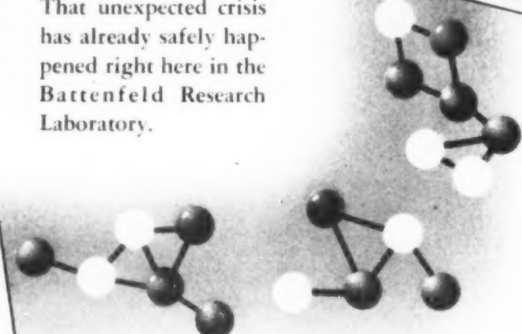

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Technical Committee

Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Vacuum Laboratories

The 1953 Symposium Subcommittee had a meeting on June 9, 1953, in Bryan, Ohio, to prepare a program for the symposium on "Dispensing Lubricating Greases in Service Stations and Garages." The symposium will be held during the Annual Meeting of the NLGI Technical Committee, in October. The subcommittee agreed that speakers would be obtained to present the viewpoint of:

1. Automobile Manufacturers
2. Service Station Operators and Garage Owners
3. Dispensing Equipment Manufacturers
4. Lubricating Grease Manufacturers

Each speaker will be given fifteen minutes for presenting his respective viewpoint regarding the problems involved in dispensing automotive greases at the service station and garage level. In addition, a paper will be given regarding the use which may be made by industry of the NLGI Technical Committee's proposed method for matching lubricating greases with dispensing equipment to obtain satisfactory delivery rates at adverse temperatures. This method is the outcome of work by the Panel on Delivery Characteristics of Dispensing Equipment for Lubricating Greases.

The subcommittee will also provide time for discussions of the papers from the floor. It is hoped that the talks will stimulate constructive discussions and that the exchange of observations and experiences will lead to mutual benefits.

Patents and Developments

Hydroxy Acid Lithium Soap Greases

Substantial improvement in mechanical stability and maintenance of consistency is claimed to be effected, according to Shell Development Company's patent 2,614,076 by substituting in whole or in part the fatty acid soap by a soap of a hydroxy fatty acid such as 10 or 12-hydroxy stearic acid and corresponding acids derived from natural sources such as from hydrogenated castor oil.

Mechanical stability of greases thickened with lithium hydroxy fatty acid soap is claimed to be greatly improved by the addition of a second metal soap, the latter being a soap of a fatty acid having a carbon atom less than 9 carbons removed from the carboxyl group which bears a substituent capable of forming a coordinate bond. This means that greases made with lithium 12-hydroxy stearate, for example, are substantially improved by addition of a minor amount of a soap of monohydroxy alkane monocarboxylic acid having 3-18 carbon atoms, wherein the OH group is in the beta, gamma or delta positions with respect to the carboxyl group, such as hydroxy propionic acids, hydroxy butyric acids, etc. Another effective group of stabilizing agents encompasses the monoamino-alkane monocarboxylic acid soaps, such as the lithium soaps of 3 aminopropionic acid, 3 aminodecanoic acid, etc. Acids having 3-18 carbon atoms are preferred. Metal soaps of monoketoalkane monocarboxylic acids having 3-18 carbon atoms, also may be used, such as Na, Ca, Al or K soaps of pyruvic acid, acetoacetic acid, etc. A particularly desirable stabilizer for lithium hydroxy fatty acid soap greases is the metallic soap of hydroxy naphthenic acid such as those derived from petroleum sources, and which are understood to be predominantly hydroxy alkylated cyclopentanoic acids, a large proportion of which are (3-ethyl-4-methyl-1-cyclopentanyl) acetic, butyric and valeric acids.

Among the aromatic acid soaps which function as mechanical stabilizing agents are the monocylic aromatic monocarboxylic acids bearing a hydrogen bonding or coordinating substituent, such as a nitro, amino, mercapto, hydroxy, keto, sulfo or thiol group attached to the aromatic ring or to a short side chain. Typical soaps in this class are Na, K, Al, Ca, or Li soaps of nitrobenzoic acids, thiolbenzoic acids, hydroxybenzoic acids, mandelic acid, tropic acid, benzoyl acetic acid, etc. Cycloalkane acid soaps also could be used.

Table I gives the roll stability of a grease containing various additives. A turbine mineral oil was used as the base lubricant. One-third of the oil was mixed with hydrogenated castor oil or with a mixture of the glyceride and stabilizing acids in proportions to yield a final grease having a total of 6% lithium soaps containing 0.25% stabilizing soaps. At 100° C., lithium hydrate was added to saponify the glyceride and the stabilizing acid, and concentrated soap slurry was heated to 200°C. to dissolve the soaps and dehydrate the composition. The remaining lubricating oil was added to quench the composition after which it was reheated to 190°C. and subsequently cooled with stirring.

TABLE I

Additive (Lithium soap)	*Roll Stability, Hours*
None	100
Lactic acid (0.1%)	500
Alpha-hydroxy stearic acid	400
Beta-hydroxy propionic acid (0.1%)	270
Gamma-hydroxy valeric acid (0.1%)	1000
Delta-hydroxy valeric acid (0.1%)	440
6-Aminocaproic acid	300
4-Ketovaleric acid (0.1%)	500
Ortho-hydroxy benzoic acid	240
Meta-hydroxy benzoic acid	200
Mandelic acid	280
Ortho-nitrobenzoic acid	350
Ortho-aminobenzoic acid	400
Oxidized hydrocarbon acids	350
Petroleum hydroxy naphthenic acids	190

Inorganically Gelled Greases

The familiar problem of water disintegration of greases gelled with inorganic agents, such as silica gel, bentonite, alumina gel, etc., is overcome in Shell Development Company's patent 2,623,852 by treating the gelling agent with a higher fatty acid amide of a condensation product of epichlorohydrin and ammonia. A tallow or stearic acid partial amide are examples of such agents which will convert the gelling agent into an oleophilic material.

Other additives which may be added to the grease are extreme pressure agents, such as sulfurized lard oil or chlorinated paraffin wax, antioxidants such as the calcium salt of the formaldehyde condensation product with p-tert. octyl phenol, etc.

Stabilized Anhydrous Alkaline Earth Soap Greases

Stable greases possessing unique thermal reversibility are described in the Standard Oil Company (Indiana) patent 2,629,692. The term "anhydrous" is used to define greases containing less than 0.1% water.

Such greases comprise essentially an alkaline earth fat or fatty acid soap, an alkaline earth soap of an oil-soluble sulfonic acid, and a viscous oil of about 60 SSU at 100°F. Calcium soaps are preferred.

A typical grease product made under this patent is described as follows:

	Per cent
Calcium soap of preferentially oil-soluble petroleum sulfonic acid	3
Calcium soap of hydrogenated tallow acids	3
Petroleum oil (S.U.S. at 100°F.—645)	94
Water (by A.S.T.M. Test D-128-47)	0

Greases of the preceding composition have a viscosity of 490 Brabender units at 77° F.

The oil soluble sulfonate preferably is made from oil soluble sulfonic acids having combined weights of 420-450. It is preferable to maintain the ratio of sulfonate to soap of fatty material at about 1:1.

Lithium Grease of Improved Properties

A lithium soap base grease claimed to possess oxidation resistance under static and dynamic conditions, as well as resistance to bleeding, age-hardening, also possessing outstanding mechanical stability and thermal reversibility, is claimed in U. S. Patent 2,629,694 issued to Shell Development Company. The invention involves a composition containing, in addition to the gel-forming agent, two particular types of additives in amounts much less than that of the gelling agent used to form the grease; the combination of which is said to produce a synergistic effect giving the superior characteristics.

These two additives are: (a) a high molecular weight organic amine, and (b) an inorganic salt, the acid portion of which contains nitrogen, carbon, and oxygen or sulfur, and may be represented by the formula:

$$\begin{matrix} R_1 \\ R_2 \end{matrix} > N - CX_1X_2H$$

where R_1 and R_2 are hydrogen or oil solubilizing groups such as normal, insoalkyl, alicyclic, aryl, alkaryl or heterocyclic; X_1 and X_2 are oxygen or sulfur. The cationic portion of the molecule may be Na, K, Li, Ca, Ba, Sr, Mg, Zn, Al, Cu, Co, Sn, Ni.

The first additive (a) may include p-phenylene diamine, b-naphthylamine, 1, 4-naphtho-hydroquinone, etc. The second additive (b) may include Ca, Ba, Na, Za, Cu or Ni salts of dibutyl mono-and dithiocarbamic acid, or Ba, Ca, Na or Zn salts of dicyclohexyl mono-and dithiocarbamic acid, etc. Generally the carbamates are used in amounts of 0.1—1%, while the amines are used in amounts of 0.25—2%. The gelling agent may be soaps of fatty acids on their glycerides, particularly hydroxy fatty acids and their glycerides.

Metal Sulfide-Thickened Greases

Lubricating grease-like compositions possessing "improved" extreme pressure characteristics may be obtained, according to Shell Development Company's patent 2,635,-078, by use of colloidal gels of sulfides of metals having a water solubility no greater than 0.0005 g. per 100 cc of water at 20° C. The outstanding materials in this class are the copper sulfides whose particle size is usually between 0.01 and 0.1 micron. Nickel and iron sulfides also are said to be effective. Suitable stabilizing agents, such as high molecular weight amines, amine salts and quaternary ammonium compounds may be employed.

Effective compositions contain 65-85% by weight of synthetic or natural oil base thickened with 15-35% of the sulfide, means for preparing which are described.

News Items

Effect of lubricant on gear performance (gears should be designed to operate in the thick film zone of lubrication)—Borsoff et al (Iron & Steel Engr. 2/53 p. 83-8).

Foote Mineral Co. will build the world's largest lithium hydroxide plant at Sunbright, Va. (N.Y. Jour. Commerce 4/24/53 p. 10).

British American Oil Co. completed its Clarkson grease plant—Johnson (World Petroleum 5/53 p. 138-140).

W. C. Hardesty, N.Y.C., is producing sodium epoxy stearate, an off-white powder containing 90% Na 9, 10-epoxy-stearic acid which is claimed to be more stable than the acid (Oil, Paint & Drug Rep. 5/18/53 p. 86).

Baker Castor Oil Co. is offering dihydroxy stearic acid for greases, cosmetics, cutting oils, etc. (Chem. Engrg. 6/53 p. 111-2).

The CCPA gave priority to the Bondi patent application on a soda soap base grease containing 0.5-1% polyethylene glycol (Carbowax 1500) over the Zimmer et al application (97 USPQ 318-23).

NLGI Associate and Technical Mem

CONTAINER AND CLOSURE MANUFACTURERS

Central Can Company
2415 West 19th Street
Chicago 8, Illinois
Representative—Henry Frazin

Continental Can Company, Inc.
1107 Waldheim Building
Kansas City 6, Missouri
Representative—T. A. Graham

Geuder, Paeschke & Frey Company
324 North Fifteenth Street
Milwaukee 1, Wisconsin
Representative—Willard J. Flint

Inland Steel Container Company
6532 South Menard Avenue
Chicago 38, Illinois
Representative—John H. Strome

J & L Steel Corp.
(Container Division)
405 Lexington Avenue
New York 17, New York
Representative—Jerry Lyons

National Steel Container Corp.
6700 South LeClaire Avenue
Chicago 38, Illinois
Representative—Henry Rudy

The Ohio Corrugating Company
917 Roanoke Ave. S. E.
Warren, Ohio
Representative—Lawrence F. McKay

Rheem Manufacturing Company
570 Lexington Avenue
New York 22, New York
Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Ralph S. Pearson

Trilla Cooperage, Inc.
2524 Blue Island Avenue
Chicago 8, Illinois
Representative—Lester Trilla

United States Steel Products
Division United States Steel Company
30 Rockefeller Plaza
New York 20, New York
Representative—Wm. I. Hanrahan

Vulcan Stamping & Mfg. Co.
P. O. Box 367
Bellwood, Illinois
Representative—H. B. Scharbach

MANUFACTURERS OF EQUIPMENT FOR APPLICATION OF LUBRICATING GREASES

Aro Equipment Corporation
Bryan, Ohio
Representative—R. W. Morrison

Balcrank, Inc.
Disney near Marburg
Cincinnati 9, Ohio
Representative—Richard P. Field

Gray Company, Inc.
60 Northeast 11th Avenue
Minneapolis 13, Minnesota
Representative—B. A. Beaver

Lincoln Engineering Company
5701 Natural Bridge Avenue
St. Louis 20, Missouri
Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
1826 Diversey Parkway
Chicago 14, Illinois
Representative—Walter Duncan

United States Air Compressor Co.
5300 Harvard Avenue
Cleveland 5, Ohio
Representative—C. A. Bening

MARKETING ORGANIZATIONS

California Texas Oil Company, Ltd.
551 Fifth Avenue
New York 17, New York
Representative—Hal U. Fisher

REFINERS

Farmers Union Central Exch., Inc.
P. O. Box G
St. Paul 1, Minnesota
Representative—H. F. Wagner

Mid-Continent Petroleum Corp.
Mid-Continent Building
P. O. Box 381
Tulsa, Oklahoma
Representative—J. W. Basore

Valvoline Oil Company
Division of Ashland Oil and Refining Co.
Box G
Freedom, Pennsylvania
Representative—D. A. Smith

SUPPLIERS OF EQUIPMENT FOR MANUFACTURING LUBRICATING GREASES

Blaw-Knox Company
Buflovak Equipment Division
1543 Fillmore Avenue
Buffalo 11, New York
Representative—Edward V. Hegg

Chemicolloid Laboratories, Inc.
30 Church Street
New York 7, New York
Representative—David F. O'Keefe

The Girdler Corporation
224 East Broadway
Louisville 1, Kentucky
Representative—J. E. Slaughter, Jr.

Morehouse Industries
707 Henry Grady Building
Atlanta 3, Georgia
Representative—George E. Missbach

The C. W. Nofsinger Company
906 Grand Avenue
Kansas City 6, Missouri
Representative—C. W. Nofsinger

Stratford Engineering Corporation
1414 Dierks Building
Kansas City 6, Missouri
Representative—J. W. Sylvester

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

American Cyanamid Company
30 Rockefeller Plaza
New York 20, New York
Representative—W. D. Thomas, Jr.

Archer-Daniels-Midland Company
Chemical Products Division
2191 West 110th Street
Cleveland 2, Ohio
Representative—Frank C. Haas

Armour & Co., Chemical Division
1355 West 31st St.
Chicago 9, Illinois
Representative—H. F. Whitler

Attapulgus Minerals & Chemicals Corporation
210 West Washington Square
Philadelphia 5, Pennsylvania
Representative—R. H. Hubbell, Jr.

The Baker Castor Oil Company
120 Broadway
New York 5, New York
Representative—H. H. Fritts

Darling & Company
4201 South Ashland Avenue
Chicago 9, Illinois
Representative—G. W. Trainor

E. I. du Pont de Nemours & Co.
Wilmington, Delaware
Representative—John R. Sabina

Emery Industries, Inc.
4300 Carew Tower
Cincinnati 8, Ohio
Representative—R. F. Brown

Enjay Company, Inc.
15 West 51st Street
New York 19, New York
Representative—Sidney W. Fay

Foote Mineral Company
18 West Chelten Avenue
Philadelphia 44, Pennsylvania
Representative—H. C. Meyer, Jr.

General Mills, Inc.
Chemical Division
400 Second Avenue South
Minneapolis 1, Minnesota
Representative—Sewall D. Andrews

A. Gross and Company
295 Madison Avenue
New York 17, New York
Representative—Eugene W. Adams

W. C. Hardesty Company, Inc.
P. O. Drawer 110
Dover, Ohio
Representative—W. G. McLeod

Harshaw Chemical Company
1945 East 97th Street
Cleveland 6, Ohio
Representative—W. J. Straka

Leffingwell Chemical Company
P. O. Box 191
Whittier, California
Representative—D. E. Murphy

bers...

Supporting Your Organization These Suppliers Of Your Industry Hold Membership in NLGI

Lithium Corporation of America, Inc.
Rand Tower
Minneapolis 2, Minnesota
Representative—Walter M. Fenton

The Lubrizol Corporation
Box 3057—Euclid Station
Cleveland 17, Ohio
Representative—John H. Baird

Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St. Louis 7, Missouri
Representative—C. E. Cosby

N. I. Malmstrom & Company
147 Lombardy Street
Brooklyn 22, New York
Representative—Ivar Wm. Malmstrom

Marcus Ruth Jerome Company
327 South LaSalle Street
Chicago 4, Illinois
Representative—Harry Bernstein

Metasap Chemical Corporation
Harrison, New Jersey
Representative—O. E. Lohrke

Monsanto Chemical Company
1700 Second Street
St. Louis 4, Missouri
Representative—J. W. Newcombe

National Lead Company
Baroid Sales Division
111 Broadway
New York 5, New York
Representative—H. H. Farnham

National Rosin Oil Products, Inc.
1270 Avenue of the Americas
New York City 20, New York
Representative—Richard Bender

Newridge Chemical Company
600 North Wells Street
Chicago 10, Illinois
Representative—T. E. Shine

M. W. Parsons—Plymouth, Inc.
59 Beekman Street
New York City 38, New York
Representative—Herbert Bye

Synthetic Products Company
1636 Wayside Road
Cleveland 12, Ohio
Representative—Garry B. Curtiss

Swift & Company
165th & Indianapolis Boulevard
Hammond, Indiana
Representative—F. H. Beneker

Vegetable Oil Products Co., Inc.
Vopcolene Division
5568 East 61st Street
Los Angeles 22, California
Representative—C. F. Williams

Warwick Chemical Company
Division Sun Chemical Corporation
10-10 44th Avenue
Long Island City 1, New York
Representative—Dr. J. J. Whitfield

Witco Chemical Company
75 East Wacker Drive
Chicago 1, Illinois
Representative—E. F. Wagner

TECHNICAL AND RESEARCH ORGANIZATIONS

Midwest Research Institute
4049 Pennsylvania
Kansas City 2, Missouri
Representative—Dr. M. H. Thornton

Petroleum Educational Institute
9020 Melrose Avenue
Los Angeles 46, California
Representative—G. A. Zamboni

Phoenix Chemical Laboratory, Inc.
3953 W. Shakespeare Avenue
Chicago 47, Illinois
Representative—Mrs. G. A. Krawetz

Sociedade Nacional de Petroleos
Rua D. Pedro V, no. 80
Lisbon, Portugal
Representative—Manuel Corda Boullosa

NEW MEMBER

The C.W. Nofsinger Company Joins

N L G I Company Representative

Upon graduating from the University of Illinois in 1922 with a B.S. in mechanical engineering, Charles W. Nofsinger joined the Sinclair Refining Company, leaving in 1926 to go with the M. W. Kellogg Company with which he remained until 1944. During the war in 1944, he was chief technologist, Refining Division, Petroleum Administration for War. From 1945 to 1950, Sinclair Development Company and Stratford Engineering Corporation retained him as consulting engineer. Since 1950 he has been president of The C. W. Nofsinger Company, which serves the petroleum and chemical industries as designers, constructors and general consultants.

C. W. Nofsinger

Mr. Nofsinger is an active member of the American Institute of Chemical Engineers, the American Chemical Society, the American Petroleum Institute, the American Society of Mechanical Engineers, the Chemists Club of New York and Rotary.

His professional career has coincided with great developments in the petroleum field, and he has been one of the important figures on the engineering side of many of the most important of these developments. After work initially with Sinclair in construction, operation, economics and process development, his responsibilities with Kellogg increased rapidly as he became successively head of the Process Section, head of the Process and Estimating Department, Process Developer, Designer and Technical Sales of hydroformers, fluid catalytic cracking plants, and virtually all the processes of modern petroleum technology. Present work ranges over the entire petroleum field, from grease through fluid catalyst plants, as well as general chemical processing.

N L G I Technical Committee Member

Mr. Apgar graduated in 1923 from Lafayette College with a B.S. degree in chemistry. Soon after, he was employed by the General Syndicate of New York City for investigation of an electrical discharge process for manufacture of benzene from crude oil. This work was followed by a transfer to the Indian Refining Company in which they had a controlling interest. After a brief period in the refinery inspection laboratory at Lawrenceville, Illinois, he was transferred to a semicommercial Cross cracking unit and later to operation of commercial Cross and Dubbs cracking units.

F. A. Apgar

At this time, The Oil Products Company, Toledo, Ohio, was having difficulty with commercial development of the Ramage vapor phase cracking process and he was loaned to them for a few months. This assignment was successfully completed and he returned to Indian, first on a special assignment for the pipeline department in Kentucky and later on research work at Lawrenceville.

The research work included studies in light oil and lubricating oil refining and treating studies. The work with lubricating oil led to conception of low pour lubricating oils which were later developed and permitted Indian's claim to first in the field.

Resigning from Indian, he joined the Sinclair research and development department where he remained for over 25 years. During this period, many studies were carried on under his direction in light oil refining and petro-chemical studies resulting in valuable commercial contributions. At the time of resigning from Sinclair Research Laboratories, Inc., he was acting director of the light oil and petro-chemical division.

While with Sinclair, he took advantage of the nearness to Chicago by taking academic and graduate courses at the University of Chicago.

During World War II he served on committees of the Coordinating Research Council which was advising army ordnance on gasoline and diesel fuel problems. Much of the work of these committees had to do with setting quality requirements which would ensure world-wide distribution of fuels of suitable use characteristics under the most severe climatic conditions.

Since July, 1952 he has been with The C. W. Nofsinger Company of Kansas City, engineers and contractors for the petroleum and chemical industries.

Some of the specialized services performed by The C. W. Nofsinger Company include: The processing and engineering design of grease and compounding plants; the processing and engineering design of ethylene producing plants; design and operation of plants for treating light oils, such as naphtha, stove oil and diesel oil and solvents for the production of odorless solvents.

PEOPLE in the Industry

Group From Packaging Institute Meeting Tours Kansas City Plants

This picture was taken on June 9, when the Subcommittee on Metal Drums and Pails (Packaging Institute) was meeting in Kansas City. That morning, this group visited the American Can Company Plant in North Kansas City, Mo. Then they made an inspection tour of the Container Division of the Jones & Laughlin Steel plant located in the Fairfax district of Kansas City, Kansas. The picture was snapped just as they left the plant for lunch. That afternoon an inspection trip was made of the Phillips Petroleum Lube Plant and Refinery. For their recommendations about the 120-pound full open head grease drum, refer to the July Spokesman.

A. J. Rumoshosky Appointed Associate Director of API Division of Marketing

The appointment of Adam J. Rumoshosky as associate director of the Division of Marketing of the American Petroleum Institute, effective August 1, was announced by President Frank M. Porter.

Simultaneously, Mr. Porter announced that a Marketing Division office will be re-opened in the New York API headquarters on the same date.

Mr. Porter said the Washington Marketing office, which has been the division's headquarters for some time, will be continued until March 1, 1954, when the current division director, Dr. John W. Frey, will retire. After that, the marketing headquarters will be located in New York.

The interim New York office will be in charge of Mr. Rumoshosky, who has been with the institute since 1937, and has been assistant director of the American Petroleum Industries Committee since 1951.

With his years of staff experience on many common marketing problems, and with his wide acquaintanceship with marketing men, Mr. Rumoshosky is considered well qualified to concentrate his efforts in the rapidly expanding field of activities in the API's Division of Marketing.

Mr. Rumoshosky is a native of Groton, Conn., but now resides at Dobbs Ferry, N. Y., with his wife and two children.

A graduate of Wesleyan University in 1937, he joined the staff of the American Petroleum Industries Committee that same year as an economist.

During his first few years in New York, he continued his studies at New York University, and won his master of arts degree in 1941.

He served in the U.S. Navy in World War II, and was a lieutenant upon his release in 1946. Shortly after returning to APIC in 1946, he became an administrative assistant, and subsequently manager of APIC's publicity section. He was appointed assistant director two years ago.

Socony-Vacuum Transfers Stefanik to Foreign Trade

Paul Stefanik, formerly chief engineer of the chemical products group of the lubricating department, Socony-Vacuum Oil Company, Inc., has been transferred to the lubricating and allied products staff of the company's foreign trade department. His new duties include coordination of chemical products activities in Europe.

Warren A. Beman, formerly in charge of chemical development and by-products activities of the chemical products group, succeeds Mr. Stefanik as chief engineer of this group.

Foote Appoints Fentress Manager of Petroleum Sales

Jim Fentress has recently been made manager of petroleum sales for Foote Mineral Company, Philadelphia, Pa. For the past year and a half Mr. Fentress has been handling petroleum sales as a sales engineer under H. C. Meyer, Jr., manager of market research.

R. D. Weinland Becomes General Manager of Purchases for Continental Can Company

Richard D. Weinland has been appointed general manager of purchases for Continental Can Company, it was announced recently by Lawrence Wilkinson, vice-president in charge of finance.

Mr. Weinland, formerly vice-president and director of the Continental Overseas Corporation, a subsidiary of the company, will fill the position held by Robert Schrader at the time of his death this year.

Mr. Wilkinson also announced that Clyde Bloedorn, assistant general manager of the Overseas Corporation, will serve as acting manager of the corporation.

Joining the Continental organization in 1932 at the company's Cincinnati plant, Mr. Weinland was transferred to the head office in New York in 1937 to assist in various foreign and export matters. He became manager of the priorities and reports department in 1943 and was named assistant general manager of the Overseas Corporation in 1946. In 1949 he was promoted to general manager, a position he held until 1951, when he was named vice-president and director of the Continental Overseas Corporation. He also was appointed manager of the company's priorities and price control department in 1950.

T. L. Kesler Joins Foote As Company Geologist

Thomas L. Kesler, a native of Salisbury, North Carolina has joined Foote Mineral Company as its geologist. Mr. Kesler has B.S. and M.S. degrees in geology from the University of North Carolina and from 1929 until 1932 worked as oil geologist for Shell Petroleum and other companies in the United States. From 1933 until 1946, he had various geological jobs with the United States Government, mostly in the area of North and South Carolina. During this period he also authored many technical papers on nonmetallic minerals in the Appalachian area and particularly on the Tin-Spodumene belt around Kings Mountain, N. C. In 1946, he became geologist with the Thompson Weiman Company with headquarters at Cartersville, Georgia. Early in 1952, he became geologist for United States Steel in Alabama and represented them in that area until joining Foote.

Mr. Kesler belongs to four technical societies in the mineral field and has served in a number of official capacities in these technical organizations. Mr. Kesler's first assignment will be at Foote's Kings Mountain Mining Division.

Assistant Controller Chosen By Stewart-Warner Corp.

Thomas J. Tucker has been appointed to the newly-created position of assistant controller of Stewart-Warner Corporation, Wilfred Reetz, controller, has announced.

Mr. Tucker, who started with Stewart-Warner as a corporate accountant in May 1948, had previously been employed by United Air Lines and with International Mining Corp., as assistant secretary-treasurer.

A native of Georgia, Mr. Tucker was graduated with a bachelor of science degree from New York University in 1943, and has completed his graduate work in business administration at the University of Chicago.

He is a member of the National Association of Cost Accountants.

More Opportunity for Youth Now, Says Roger M. Blough

U. S. Steel Vice-Chairman Roger M. Blough denounced the "gloom vendors" of America's future and cited 15 examples of why this country now offers more opportunity for youth than in any other time in history.

Addressing the graduating class of Susquehanna University, where he graduated in 1925, Mr. Blough declared "In no other hour in the world's history could you have picked a better time to start wrestling with more really fine opportunities or more really dangerous problems crying to be solved."

Pointing out that technological progress in the steel industry is in its infancy, Mr. Blough declared the industry is a typical challenge which American youth is destined to answer.

Fresh ideas, he said, are needed to supplant those of the older genera-

tion who find "movement to new ground" difficult.

"As the self-appointed guardians of a nostalgic past which is dead as a door nail, we cry out in anguish about the wars and all manner of other worries," Mr. Blough said. "But I think we cry in vain. The world is inching forward, drawn by its own inward strength, physically, morally and spiritually. Your youthful eyes can discern it and you can be part of that ceaseless movement if you but will it."

In documenting his optimism for the future, Mr. Blough cited the following examples of how the world is continuing to move forward:

1. The plastic industry, an infant, has expanded 600 per cent in the past ten years.

2. The glass industry in the past 25 years has made more progress than in the previous 2,500 years.

3. Development of a cheaper way to refine titanium, which among other things would cut in half the weight of a jet engine, would open an entire new industry.

4. Developments in electronics in recent years with inventions such as television, radar and the transistor indicate the industry still is in its early stages.

5. The chemical industry, which has never stopped growing.

6. New types of agricultural implements need to be developed and manufactured to feed our growing population.

7. The mining and oil industries now are operating at a peak, but demands of the future will call for greater expansion and more effective operations.

8. Transportation, although it has grown rapidly in the past 30 years with the perfection of the automobile, the diesel locomotive and the airplane, will increase operations with technical advances to be made in the future.

9. Home appliances which have taken the drudgery out of housekeeping and have provided greater comfort offer a wide field for further development.

10. Atomic energy, the baby of them all, has only started to be used for peacetime human usefulness.

11. Education has made great strides with a bright future in store. There are now 50 college students for every one student 75 years ago.

12. International affairs, at a treacherous low ebb, has unlimited possibilities.

13. Medicine has increased the life span from 40 years to 67 in the past 75 years, but the field still is faced with many problems to be solved.

14. Religion has moved forward, yet there still is an opportunity to reach many more in the "shadows of doubt, despair and distrust."

15. The steel industry still is in its swaddling clothes and there are thousands upon thousands of opportunities for youthful, imaginative, searching minds.

B. F. Fairless Lays Down Rules for Happiness

U. S. Steel Chairman Benjamin F. Fairless received an honorary Doctor of Laws degree from Knox College and counseled its graduating class that success from wealth, power or fame cannot guarantee happiness. Only by reaching whatever goal we seek in life can an individual attain happiness, he said.

Mr. Fairless, in a commencement address, laid down three rules for seeking happiness:

1. "If you find real joy in your work, you can hardly fail to succeed at it; but if it is only a dull reluctant grind to you, you can scarcely hope to be more than a discontented plodder all your life."

2. "You should have something worth working for; because fame and fortune, and even the crowning satisfaction of a job well done, can be an empty reward unless there is someone, somewhere, with whom you can share the enjoyment of your triumphs."

3. "You will find as you grow older that success for yourself, and security for your family are not enough; for the real measure of happiness lies in the contribution which you will make to the welfare and progress of your fellow men."

Prospects for today's college graduate are unlimited, Mr. Fairless declared. "Never before has man discovered so much about which he knows so little. Truly this is an age of progress unlimited, nor is the progress of this age confined by any means to the fields of science, business and industry.

"In the field of the creative arts, our poets, playwrights, authors and commercial artists can hardly keep pace with the insatiable demands which are made upon them by the hungry presses, microphones and television cameras of our modern age.

"As for the professions—well, someone has estimated that 30 million laws have been enacted since the days of Moses, and while it may be true that none of these statutes has improved perceptibly upon the Ten Commandments and the Golden Rule, they have certainly created enough confusion to provide for the future growth of the legal profession for many centuries to come."

Mr. Fairless discounted cynics who believe the world is headed for destruction because of the atom bomb. "I happen to have a great deal of confidence in the Architect who built this world in the first place; and until it has finally fulfilled the destiny which He intended for it, I do not believe that mere mortals will ever succeed in destroying His handiwork.

"I doubt whether all of our most brilliant scientists, working together and using all the awful knowledge they possess, could yet devise a means of exterminating mankind from this earth, even if they wished to do so."

Socony-Vacuum Sends Baur To Dakar, French West Africa

Marcel A. Baur, district manager in Cleveland the past seven years for Socony-Vacuum Oil Company, Inc., sailed from New York July 7 for Dakar, French West Africa, where, after a short period of orientation, he will become general manager of the Societe des Petroles Socony-Vacuum de l'Afrique Occidentale Francaise.

This company is engaged in the distribution of Flying Red Horse products in the seven consolidated colonies of French West Africa and in French Togoland and Liberia, and in the refueling of aircraft and deep-sea vessels.

In Cleveland, Mr. Baur served as state chairman of the Ohio Oil Industry Information Committee and as president of the Petroleum Club of Cleveland. He has been a member of the Cleveland Athletic Club and a 32d degree Mason of the Al Koran Shrine.

Mr. Baur joined Socony-Vacuum in 1926 in Paris, France, after passing his baccalaureates in science, languages, and philosophy at the Sorbonne. He had gone to France after receiving a bachelor's degree in petroleum engineering from the University of Pittsburgh.

Humphrey Joins Staff of OIIC

Philip C. Humphrey has joined the staff of the Oil Industry Information Committee of the American Petroleum Institute. His appointment as deputy director was announced by Executive Director H. B. Miller.

Mr. Humphrey came to the OIIC from the Texas Company, where he had been manager of public relations for the past 11 years.

He has been identified with the Oil Industry Information Committee program since its inception in 1947, and has served three terms as a vice chairman of the national group.

In his new post, Mr. Humphrey will be in direct charge of all creative work.

As a member of the national OIIC, Mr. Humphrey has helped in the guidance of the program through the years. In addition, he also served as chairman of the film subcommittee, which directed production of such motion pictures as "Crossroads, U.S.A.," "Man on the Land," "24 Hours of Progress," and "The Last 10 Feet." Three of these motion pictures won citations from Freedoms Foundation, Inc.

Assistant Director Named To General Petroleum Corp.

Thomas P. Simpson, director of the research and development department of Socony-Vacuum Oil Company, Inc., at Paulsboro, N. J., became assistant director of manufacturing of the company's West Coast affiliate, General Petroleum Corporation, August 1.

Theodore W. Nelson, associate director of Socony-Vacuum Laboratories, succeeds Mr. Simpson at Paulsboro.

These changes were announced by William M. Holaday, director of Socony-Vacuum Laboratories, which include the research and development department at Paulsboro, where processes such as thermofor catalytic cracking and thermofor catalytic reforming have been developed; the field research laboratories in Dallas, where research on crude oil exploration and production problems is conducted; and the technical service department in Brooklyn, which works on development of new products and control of product quality.

Mr. Simpson started his career in the oil business with General Petroleum Corporation in 1924, and in 1933 became supervisor of that company's process laboratories. He was transferred to Socony-Vacuum in 1935 as

chief development engineer and assumed his present position in 1947. In his new post, he will assist Gale L. Adams, General Petroleum's vice-president and director of manufacturing.

Mr. Nelson joined Socony-Vacuum in 1934 as an engineer at the company's Augusta, Kans., refinery. From 1937 to 1946 he served in various capacities at the research and development department in Paulsboro. He became director of the company's field research laboratories in Dallas in 1946 and assumed his present position in 1952.

U. S. Steel Announces Appointment of E. E. Moore

C. F. Hood, president, United States Steel Corporation, announced the appointment of E. E. Moore as assistant to president and vice-president. Mr. Moore has been U. S. Steel's vice-president, industrial relations–administration.

After serving overseas during World War I, Mr. Moore joined U. S. Steel in 1919 at Gary, Indiana, where he secured employment as a construction machinist in the plant of the American Sheet and Tin Plate Company. Since that time, Mr. Moore's extensive experience in U. S. Steel has included management responsibilities in the Roll and Machine Works in Canton, Ohio, and the Shenango Works at New Castle, Pennsylvania. In 1926 he returned to Gary to become assistant manager in charge of construction and operation of U. S. Steel's first wide four-high hot and cold strip mill.

In 1932 Mr. Moore became assistant to the vice-president of the Illinois Steel Company and upon the formation of Carnegie-Illinois Steel Corporation in 1935 he was made general superintendent of its South Steel Works in Chicago. Three years later he became general superintendent of the Gary Steel Works and in 1940 was transferred to Pittsburgh as vice-president, industrial relations.

Mr. Moore is an active member of many professional and community organizations. He is president and chairman of the board of Junior Achievement of Pittsburgh, Inc., vice-president of the Civic Light Opera, and a member of the board of directors of the Pittsburgh chapter of the American Red Cross. He is also associated with the Pittsburgh Personnel Association and the Western Pennsylvania Safety Council. Mr. Moore is a member of the Engineers Society of Western Pennsylvania, the American Iron and Steel Institute and the Association of Iron and Steel Engineers.

Four Promotions Made By Deep Rock Oil Corp.

Deep Rock Oil Corporation announced four promotions among key personnel in the company's land and exploration division.

John L. Ferguson, vice-president of the division, said the shifts assure the company of streamlined operations in the midcontinent area and eliminate duplication of effort in some areas. A major part of the program, Mr. Ferguson said, includes the splitting of division operations into a North and South region, each with a separate manager.

Castle J. C. Harvey, head of Deep Rock's geophysical department, has been named regional exploration manager of the company's South region, which covers roughly the area south of Oklahoma's northern boundary. Area offices in the South region are located at San Antonio and Wichita Falls, Tex., and at Tulsa.

R. B. Hurlbutt, assistant to the manager of the geological department, has been appointed regional exploration manager of the North region, which extends north of the Oklahoma boundary. Area offices in Mr. Hurlbutt's region are in Wichita, Kans., Denver, Colo., and Bismarck, N. D.

Samuel T. Coleman, manager of the land department, has been promoted to the position of assistant manager of Deep Rock's land and exploration division.

Dale Benedict, assistant to the manager of the land department, has been named manager of Deep Rock's land and records department. In his new position, Mr. Benedict will deal particularly with head office activities in finalizing prospects for drilling and with land and lease record operations.

Foote Adds Ted Evans To Sunbright, Va., Staff

Ted Evans, mining engineer and graduate of McGill University, has been added to the Sunbright, Va., staff of the Foote Mineral Company as mining superintendent.

Mr. Evans has a wide background of experience in mining activities including employment with National Gypsum Company as a mining supervisor and as a service engineer with Hercules Powder Company.

Socony-Vacuum Announces Several Personnel Changes In Research and Development

Several personnel changes in the research and development department of Socony-Vacuum Oil Company, Inc., at Paulsboro, N. J., have been announced by T. W. Nelson, director of the department.

T. A. Petry becomes a supervisor in the development division;

H. E. Rasmussen becomes assistant supervisor of the refining section;

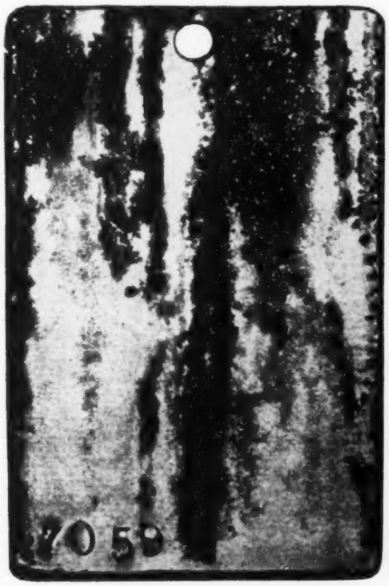
D. P. Heath becomes assistant supervisor of the fuels and lubricants section;

R. R. Halik and L. M. Browning become research associates in the process development section.

1,000-hour test of grease based on

Metasap* Aluminum Stearate

defies rust, corrosion, and damage from salt spray



Rust marks show that grease "A" failed to protect this test panel.

Grease "B" did not prevent this serious rusting and pitting in 1,000 hours.

But Metasap Aluminum Stearate Base grease completely protected this panel.

FARM machinery takes some awful punishment from the weather. Especially in salty air along seacoast areas. Probably no more taxing service could be found for a protective lubricant. Yet, a leading nationally-known grease maker found by test how to defend farm machinery from even the most grueling weather conditions.

After coating testing panels with grease based on Metasap Aluminum Stearate and keeping them in humidity and salt spray cabinets for 1,000 hours, he says results convinced him that such a grease is "*head and shoulders above other greases.*"

Not only do Metasap Aluminum Stearate greases provide a top-notch protective agent for farm machinery anywhere, but such greases have proved equally superior for tough lubricating jobs in many other arduous services.

Metasap Aluminum Stearate Bases can probably solve a difficult lubricating problem for you. We'll be glad to help you select the correct base for any given oil, to meet your needs. Or achieve any desired effect in a finished grease, through use of proper soap mixtures.

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WATCHING THE "NO RESERVATION" BOYS TRY TO GET A ROOM FOR THE NLGI ANNUAL MEETING, OCTOBER 26-28!

Industry NEWS

63 New Standards Approved At ASTM Annual Meeting

Featured by 34 technical sessions at which were presented 131 technical papers covering various aspects of engineering materials, the 1953 annual meeting of the American Society for Testing Materials, held throughout the week of June 28 at Atlantic City, also included 565 meetings of the technical committees. The registered attendance of 2472 compares favorably with the 1952 Golden Anniversary Meeting, including the 10th Apparatus Exhibit figure of 2606.

Seventy-two of the society's technical committees reported at the meeting, with the result that 63 new specifications and tests were approved and revisions in 185 existing tentatives and standards were acted on. A total of 62 specifications and tests that have been published previously as tentative were approved for reference to society letter ballot for adoption as standard. All of these new and revised standards will be published later in the year in the 1953 Supplement to the Book of ASTM Standards.

Including the 1953 annual meeting actions there are now about 1965 ASTM Standards. This compares with the figure 20 years ago of 690 and ten years ago, 1943, of about 1200. These figures indicate a definitely increased tempo in standardization activities during the last decade.

Marburg and Gillett Lectures

Two outstanding lectures were presented during the meeting, one on "An Excursion in Petroleum Chemistry," by Dr. Frederick D. Rossini, Silliman Professor and Head of the Department of Chemistry and Director of the American Petroleum Institute Research Laboratory at the Carnegie Institute of Technology; the other by Jerome Strauss, Vice-President, Vanadium Corp. of America, New York, on "Micrometallurgy." In his Marburg Lecture Dr. Rossini described outstanding developments in our knowledge of petroleum and discussed projects supported cooperatively by the petroleum industry through the American Petroleum Institute. In the lecture commemorating H. W. Gillett, one of the country's leading metallurgists, Mr. Strauss reviewed the influence on metals and alloys of small additions of other metals with the Lecture devoted entirely to exceedingly small percentages over a very broad range of metallurgical experimentation and practice.

New Officers

Leslie C. Beard, Jr., Assistant Director of Socony-Vacuum Laboratories, Socony-Vacuum Oil Co., Inc., New York, N. Y., was elected President for 1953-1954, succeeding H. L. Maxwell, Technical Adviser, Engineering Department, E. I. Du Pont de Nemours and Co., Inc., Wilmington, Del., who continues on the Board of Directors as Past-President for three years.

C. H. Fellows, Director, Engineering Laboratory and Research Dept., The Detroit Edison Co., Detroit, Mich,. is the new Vice-President.

The new members of the Board of Directors are as follows:

N. A. Fowler, Director of Sales and Research, General Box Co., Des Plaines, Ill.; R. T. Kropf, Vice-President, Industrial Thread Div., Belding Heminway Corticelli, New York, N. Y.; T. F. Olt, Director, Research Labs., Armco Steel Corp., Middletown, Ohio; J. R. Townsend, Director of Material and Standards Engineering, Sandia Corp., Sandia Base, Albuquerque, New Mexico; and K. B. Woods, Associate Director, Joint Highway Research Project and Professor of Highway Engineering, Purdue University, Engineering Experiment Station, Lafayette, Ind.

1954 ASTM Meeting Dates

It was announced that the 1954 Annual Meeting of the Society will be held from June 14 to 18, inclusive, 1954, at the Hotels Sherman and Morrison in Chicago. There will be an exhibit of testing apparatus and a photographic exposition.

The 1954 Spring Meeting and Committee Week is scheduled for February 1 to 5 at the Hotel Shoreham, Washington, D. C.

Steam Stripping Column Added to Witco's Chicago Plant

This steam stripping column, now being added to the ester production facilities at the Chicago plant of Witco Chemical Company, is expected to double the plant's ester production. In addition to speeding up present ester production and improving the clarity, this unit will make it possible to process many new esters.

New Bearing Packer Works From Original Containers

A new heavy duty bearing packer that operates in original grease containers has been announced by the Gray Company, Inc., manufacturers of automotive and industrial lubricating equipment.

Packing bearings with the new *Presto-Paks* is fast—and easy. It makes the slow paddle method of transferring grease from container to separate reservoir unnecessary. Grease stays clean all the way from container to bearing.

Designed to handle all bearings from ¾ in. ID to 7½ in. OD (small end). Pressure screw tightens fast by finger pressure—holds bearing in place. The hand-operated pump instantly supplies a large volume of grease, literally "pops" through to flush out dirt and provide even grease pressure throughout the bearing. Follow plate assures constant grease supply. A few quick

turns of the screw and bearing is removed, properly packed and ready for work. Hinged cover can't be lost and keeps the bearing receiver free of dust and dirt when not in use.

Presto-Paks are available in three sizes. All include follow plate, adjustable cover, pump and covered packing unit. Write for Bulletin #25 on these new units to the Gray Company, Inc., 1018 Sibley St., Minneapolis 13, Minn.

AIEE Meeting Will Feature Petroleum Sessions, Nov. 2-6

Special emphasis on uses of electric power in the petroleum industry will be given to the technical program that will be a part of the fall general meeting of the American Institute of Electrical Engineers in the Hotel Muehlebach, Kansas City, Mo., Nov. 2-6, it has been announced by C. G. Rousch, Kansas City manager of Westinghouse Electric Corp., and general chairman of the meeting.

Electrical engineers from all over the country have been invited to this meeting, which is held annually for the purpose of keeping members of the profession up to date on developments and inventions in the electrical art.

In addition to the technical program, which will be devoted to many aspects of electrical engineering and the allied arts, and the petroleum sessions, inspection trips, sight seeing trips, a smoker, a banquet and entertainment for both men and women are planned by Mr. Rousch and 11 committees.

U. S. Steel Will Sponsor New Television Show

United States Steel Corporation has announced that the television network of the American Broadcasting Company has been selected to carry its new TV program, "United States Steel Theatre." The full-hour live dramatic show, to be produced for the corporation by the Theatre Guild, will be under the direct supervision of J. Carlisle MacDonald, assistant to chairman of the board of U. S. Steel, in charge of public relations. It will originate in New York City, on alternate Tuesday nights, 9:30-10:30 p.m. (EST). "United States Steel Theatre" will alternate with another hour-long dramatic program. An October starting date is planned.

Witco Reduces Accidents

Results of a new safety program, started July 1952, at Witco Chemical Company's Chicago plant, show that accidents have been reduced by 60 per cent. The record of no lost time accidents since October 1952, has raised the plant from an average safety bracket to well above average.

The program revolves around the work of a management-employee safety committee which meets once a month to discuss precautionary measures, new ideas, follow-ups on previous recommendations and methods for making every employee constantly alert for accident prevention.

Continental Blacks, Inc., Plans To Build Plant at Ponca City

Continental Blacks, Inc., will build a plant at Ponca City designed to manufacture 40 million pounds annually of high abrasion furnace black. This will supplement the production of a similar amount of HAF type black produced at Lake Charles, La., over the past two years.

Announcement of this new facility was made recently by L. F. McCollum, president of Continental Oil Company, and Robert I. Wishnick, president of Witco Chemical Company which will market the output of this plant. Construction of this facility, which will receive its raw material from Conoco's refinery at Ponca City will start immediately and is expected to be completed early in 1954.

The advantages gained by the use of HAF black in compounding "cold" rubber have been thoroughly demonstrated and this type of carbon black is in great demand by tire manufacturers. Witco-Continental HAF black has proved to be one of the best of this type of black and the additional production has been necessary to supply the demand.

In addition to HAF black, Witco-Continental supplies all the usual grades of furance and channel blacks to the rubber, paint, plastic, printing ink, and paper industries.

Midwest Research Reports New Sources of Raw Sulfur

An encouraging report about new sources of raw sulfur, to supplement current industrial stockpiles, is presented in a new survey booklet released by Midwest Research Institute in Kansas City.

Increased use of sulfur from natural and refinery gas, and greater utilization of pyrites to produce sulfur are included in the forecast by the chemistry staff at Midwest Research Institute.

The report is the first in a series of Institute studies of various technological trends in Midwestern industry. Other reports, now in preparation, will deal with applications of industrial instrumentation, and opportunities for chemical expansion in the Midwest.

Pyrites likely will develop into a major source for sulfuric acid in the years ahead, according to the sulfur survey. Smelter gases and substitutes such as gypsum and calcium sulfate also will become increasingly important.

The report discusses processes which aim at substitution of other acids for sulfuric acid.

"Fertilizer manufacturers, large consumers of acid, have considered that the substitution of nitric or phosphoric acid for sulfuric acid would have some advantages," the survey asserts.

In exploring the manufacturing cost of sulfuric acid, it is found, the report states, that the upward price trends for all forms of sulfur will hike the price of sulfuric acid above $25 a ton within the next few years. The study indicates that manufacturers may want to review acid supply requirements in view of this price shift.

Lithium Corp. of America Liquidates Metalloy Corp.

K. M. Leute, president of Lithium Corporation of America, Inc., has announced that effective July 1, 1953, Lithium Corporation of America, Inc., is liquidating its wholly owned subsidiary Metalloy Corporation. Metalloy previously has operated as the chemical and sales division of the parent company.

This change in no way affects administrative personnel. Hereafter, all business will be conducted under the name of Lithium Corporation of America, Inc.

Monsanto Plans Laboratory

Plans for immediate construction of a four-story engineering research laboratory at its Nitro, W. Va., plant were announced by Monsanto Chemical Company.

The 60-by-85-foot structure, expected to be completed by mid-1954, follows closely the completion last year of additional research laboratory facilities at the Nitro location and reflects Monsanto's continuing emphasis on research.

It will house various items of equipment for process development and engineering research as well as offices and storage facilities. A high degree of flexibility and versatility has been designed into the unit.

Approximately eight technologists will staff the facility initially, with provision for an ultimate capacity of 15 to carry on process and engineering research in the fields of rubber and agricultural chemicals, oil additives and synthetic detergents.

API Sets Up Subcommittee For Educational Program

A Special Educational Program Subcommittee has been set up by the Division of Marketing of the American Petroleum Institute to study the advisability of API cooperation in the development of management institutes for distributors and jobbers.

The subcommittee was appointed by J. E. Dyer, chairman of the Jobber Advisory Committee. It was instructed to "undertake a study of what has already been done and is being done in the field of adult education with particular reference to programs of education in management sponsored by industry and administered by existing institutions of higher learning."

FUTURE MEETINGS of the Industry

AUGUST, 1953

17-19 Society of Automotive Engineers (international West Coast meeting), Georgia Hotel, Vancouver, B. C., Canada.

18-21 National Congress of Petroleum Retailers, William Penn Hotel, Pittsburgh, Pa.

SEPTEMBER, 1953

6-11 American Chemical Society (124th national meeting), Conrad Hilton Hotel, Chicago, Ill.

9-11 Oil Industry Information Committee, Cleveland Hotel, Cleveland, Ohio.

13-16 American Inst. of Chemical Engineers, Fairmont and Mark Hopkins Hotels, San Francisco, Calif.

14-17 Society of Automotive Engineers (national tractor meeting and production forum), Schroeder Hotel, Milwaukee, Wis.

15-16 American Petroleum Institute (executive committee), Greenbrier Hotel, White Sulphur Springs, W. Va.

16 American Petroleum Institute (Division of Marketing, Lubrication Committee meeting), The Traymore, Atlantic City, N. J.

16-18 National Petroleum Assn. (51st annual meeting), The Traymore, Atlantic City, N. J.

21-23 American Trade Assn. Executives (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

24-25 Western Petroleum Refiners Assn. (regional meeting), Henning Hotel, Casper, Wyo.

27-29 National Assn. of Oil Equipment Jobbers (annual meeting), Neil House, Columbus, Ohio.

27 to Oct. 2 American Society for Testing Materials (Committee D-2 on Petroleum Products and Lubricants), Shoreham Hotel, Washington, D. C.

29 to Oct. 3 Society of Automotive Engineers (national aeronautic meeting), Statler Hotel, Los Angeles, Calif.

OCTOBER, 1953

4-6 American Assn. of Oilwell Drilling Contractors, Denver, Colo.

5-7 Texas Mid-Continent Oil and Gas Assn. (34th annual meeting), Rice Hotel, Houston, Texas.

7-9 National Assn. of Corrosion Engineers, South Central Region (annual meeting), Mayo Hotel, Tulsa, Okla.

8 Virginia Oil Jobbers Assn. (fall convention), Roanoke Hotel, Roanoke, Va.

9 Virginia Oil Men's Assn. (fall convention), Roanoke Hotel, Roanoke, Va.

11-17 Oil Progress Week.

14-15 Indiana Independent Petroleum Assn. (fall convention), Severin Hotel, Indianapolis, Ind.

15-16 Petroleum Marketers Assn. of Texas (annual meeting), Adolphus Hotel, Dallas Texas.

19-20 Independent Petroleum Assn. of America (annual meeting), Texas Hotel, Ft. Worth, Texas.

19-23 National Safety Council, Conrad Hilton, Congress, Morrison, Sheraton, Chicago, Ill.

22-23 Western Petroleum Refiners Assn. (regional meeting), Garrett Hotel, Eldorado, Ark.

25-27 Pennsylvania Petroleum Assn. (fall convention), Pocono Manor, Pocono Manor, Pa.

26-28 National Lubricating Grease Institute (21st annual meeting), Edgewater Beach Hotel, Chicago, Ill.

28-29 Independent Oil Compounders Assn. (6th annual meeting), Edgewater Beach Hotel, Chicago, Ill.

29-30 Society of Automotive Engineers (international production meeting), Royal York Hotel, Toronto, Ontario, Canada.

NOVEMBER, 1953

2-4 Society of Automotive Engineers (national transportation meeting), Conrad Hilton Hotel, Chicago, Ill.

2-4 American Oil Chemists' Socy. (27th fall meeting), Sherman Hotel, Chicago, Ill.

3-4 Society of Automotive Engineers (national diesel engine meeting), Conrad Hilton Hotel, Chicago, Ill.

4-5 Nebraska Petroleum Marketers (annual convention), Paxton Hotel, Omaha, Nebr.

NOVEMBER, 1953

5-6 Society of Automotive Engineers (national fuels and lubricants meeting), Conrad Hilton Hotel, Chicago, Ill.

9-11 The Geological Society of America (annual meeting), Royal York Hotel, Toronto, Ontario, Canada.

9-12 American Petroleum Institute (33rd annual meeting), Conrad Hilton Hotel and Palmer House, Chicago, Ill.

29-Dec. 4 American Society of Chemical Engineers (annual meeting), Statler Hotel, New York, N. Y.

30 to Dec. 5 Twenty-fourth Exposition of Chemical Industries, Grand Central Palace, New York, N.Y.

DECEMBER, 1953

13-16 American Inst. of Chemical Engineers (annual meeting), Jefferson Hotel, St. Louis, Mo.

JANUARY, 1954

11-15 Society of Automotive Engineers (annual meeting and engineering display), Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

FEBRUARY, 1954

8-9 Missouri Petroleum Assn. (annual convention), Chase Hotel, St. Louis, Mo.

8-10 Missouri Petroleum Assn. (annual convention), Chase Hotel, St. Louis, Mo.

WITCO stearates are especially noted for a high degree of uniformity, freedom from foreign matter, low moisture and low soluble salt content. They produce medium to extremely high gels of excellent stability, smoothness and color, and their superior gelling characteristics tend to make them more economical.

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WITCO Aluminum Stearate No. 22-G . . . extremely high gel. Produces greases of excellent stability with minimum tendency to bleed. Excellent color and clarity.

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FUTURE MEETINGS

FEBRUARY, 1954

15-17 American Petroleum Institute (Lubrication Committee), Sheraton-Cadillac Hotel, Detroit, Mich.

17-18 Iowa Independent Oil Jobbers Assn., Fort Des Moines Hotel, Des Moines, Iowa.

MARCH, 1954

1-5 American Society for Testing Materials (spring meeting), Shoreham Hotel, Washington, D. C.

2-4 Society of Automotive Engineers (national passenger car, body, and materials meeting), Hotel Statler, Detroit, Michigan.

3-5 American Petroleum Institute (Division of Production, Southwestern District), Rice Hotel, Houston, Tex.

8-10 American Inst. of Chemical Engineers, Statler Hotel, Washington, D. C.

17-19 American Petroleum Institute (Division of Production, Mid-Continent District), Skirvin Hotel, Oklahoma City, Okla.

APRIL, 1954

12-15 Society of Automotive Engineers (national aeronautical meeting, aircraft engineering display, and aircraft production forum), Hotel Statler, New York, N. Y.

MAY, 1954

2-4 Independent Petroleum Assn. of America (midyear meeting), Cosmopolitan Hotel, Denver, Colo.

3-5 American Petroleum Institute (Lubrication Committee), Skytop Lodge, Skytop, Pa.

10-12 American Petroleum Institute (Division of Transportation, Products Pipe Line Conference), Warwick Hotel, Philadelphia, Pa.

10-13 American Petroleum Institute (Division of Refining, Midyear Meeting), Rise Hotel Houston, Texas.

17-19 American Petroleum Institute (Division of Marketing, Midyear Meeting), Cosmopolitan Hotel, Denver, Colo.

JUNE, 1954

6-11 Society of Automotive Engineers (summer meeting), The Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

13-18 American Society for Testing Materials (annual meeting and exhibits), Sherman Hotel, Chicago, Ill.

17-19 American Petroleum Institute (Division of Production, Eastern District), Greenbrier Hotel, White Sulphur Springs, W. Va.

AUGUST, 1954

16-18 Society of Automotive Engineers (national West Coast meeting), Los Angeles, Calif.

SEPTEMBER, 1954

12-16 Society of Automotive Engineers (national tractor meeting), Schroeder Hotel, Milwaukee, Wis.

OCTOBER, 1954

4-9 Society of Automotive Engineers(national aeronautic meeting), aircraft engineering display, and aircraft production forum, Hotel Statler, Los Angeles, Calif.

Week of Oct. 18 Society of Automotive Engineers (national transportation meeting), Boston, Mass.

25-27 National Lubricating Grease Institute (22nd annual meeting), Mark Hopkins Hotel, San Francisco, Calif.

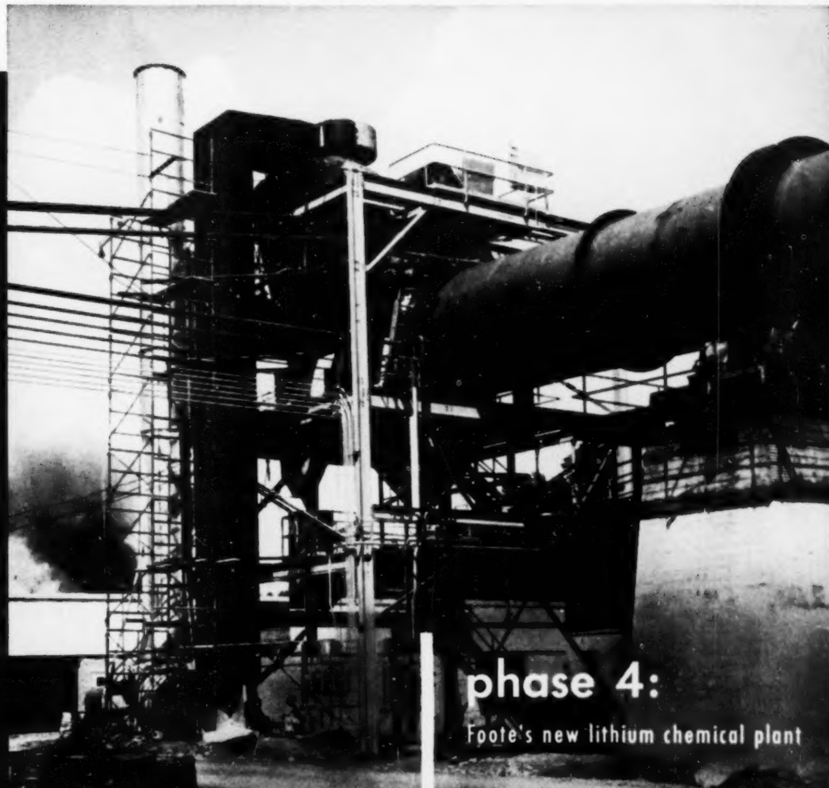
26-27 Society of Automotive Engineers, national diesel engine meeting, Hotel Statler, Cleveland, Ohio.

NOVEMBER, 1954

1-2 Independent Petroleum Assn. of America (annual meeting), Shamrock Hotel, Houston, Texas.

4-5 Society of Automotive Engineers (national fuels and lubricants meeting), Mayo Hotel, Tulsa, Okla.

Head feed end of 340' kiln at Foote's Sunbright, Virginia plant.



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phase 1—Continuing Foote research... finding new and improved uses for lithium chemicals.

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